

(c) Unoccupied volumes of a power car or a trailer car designed to crush as part of the crash energy management design are not subject to the requirements of this section.

**§ 238.407 Anti-climbing mechanism.**

(a) Each power car shall have an anti-climbing mechanism at its forward end capable of resisting an ultimate upward or downward static vertical force of 200,000 pounds. A power car constructed with a crash energy management design is permitted to crush in a controlled manner before the anti-climbing mechanism fully engages.

(b) Interior train coupling points between units, including between units of articulated cars or other permanently joined units of cars, shall have an anti-climbing mechanism capable of resisting an upward or downward vertical force of 100,000 pounds without yielding.

(c) The forward coupler of a power car shall be attached to the car body to resist a vertical downward force of 100,000 pounds for any horizontal position of the coupler without yielding.

**§ 238.409 Forward end structures of power car cabs.**

This section contains requirements for the forward end structure of the cab of a power car. (A conceptual implementation of this end structure is provided in Figure 1 to this subpart.)

(a) *Center collision post.* The forward end structure shall have a full-height center collision post, or its structural equivalent, capable of withstanding the following:

(1) A shear load of 500,000 pounds at its joint with the underframe without exceeding the ultimate strength of the joint;

(2) A shear load of 150,000 pounds at its joint with the roof without exceeding the ultimate strength of the joint; and

(3) A horizontal, longitudinal force of 300,000 pounds, applied at a point on level with the bottom of the windshield, without exceeding its ultimate strength.

(b) *Side collision posts.* The forward end structure shall have two side collision posts, or their structural equivalent,

located at approximately the one-third points laterally, each capable of withstanding the following:

(1) A shear load of 500,000 pounds at its joint with the underframe without exceeding the ultimate strength of the joint; and

(2) A horizontal, longitudinal force of 300,000 pounds, applied at a point on level with the bottom of the windshield, without exceeding its ultimate strength.

(c) *Corner posts.* The forward end structure shall have two full-height corner posts, or their structural equivalent, each capable of withstanding the following:

(1) A horizontal, longitudinal or lateral shear load of 300,000 pounds at its joint with the underframe, without exceeding the ultimate strength of the joint;

(2) A horizontal, lateral force of 100,000 pounds applied at a point 30 inches up from the underframe attachment, without exceeding the yield or the critical buckling stress; and

(3) A horizontal, longitudinal or lateral shear load of 80,000 pounds at its joint with the roof, without exceeding the ultimate strength of the joint.

(d) *Skin.* The skin covering the forward-facing end of each power car shall be:

(1) Equivalent to a ½-inch steel plate with a 25,000 pounds-per-square-inch yield strength—material of a higher yield strength may be used to decrease the required thickness of the material provided at least an equivalent level of strength is maintained;

(2) Securely attached to the end structure; and

(3) Sealed to prevent the entry of fluids into the occupied cab area of the equipment. As used in paragraph (d), the term “skin” does not include forward-facing windows and doors.

**§ 238.411 Rear end structures of power car cabs.**

The rear end structure of the cab of a power car shall be designed to include the following elements, or their structural equivalent. (A conceptual implementation of this end structure is provided in Figure 2 to this subpart.)

(a) *Corner posts.* The rear end structure shall have two full-height corner